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ABSTRACT

Computer instruction can offer particular benefits to the Indian child. Computer use emphasizes the visual facets of learning, teaches language based skills needed for higher education and careers, and provides types of instruction proven effective with Indian children, such as private self-testing and cooperative learning. The Hupa, Yurok, Karuk, and Tolowa tribes have found a cooperative learning methodology effective in teaching reading and writing, and have developed a computer curriculum for cooperative learning. These tribes have installed their own phonetic alphabet, Unifon, on the Macintosh computer, and have produced bilingual instructional materials. In one project, part of a bilingual field experience for teacher credential candidates, students in grades 3 through 8 used the computer to produce bilingual natural history dictionaries in Hupa/English and Yurok/English. Working in teams of two or three, students wrote what they knew about particular plants and animals, translated their sentences into English, and designed page layouts. Older children served as role models for younger children, who could feel more comfortable about their contributions, knowing they were making guided choices. The teacher served as supervisor and resource. The Macintosh computer has the unique capacity of installing extra fonts, sets of characters. Any software program with a font menu can be used to write a bilingual text. This paper includes a list of Macintosh software programs, identifying skill areas and educational level for each. 14 references. (SV)

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TEACHING AND LEARNING WITH COMPUTERS

A Method for American Indian Bilingual Classrooms

BY

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Teaching and Learning with Computers!

A Method for American Indian Bilingual Classrooms

by Ruth Bennett
Humboldt State University

INTRODUCTION: Computers and Learning

Computer instruction is a widely accepted strategy for focussing on teaching and learning. Computer instruction has gained widespread acceptance among educators, because it is being recognized that computer skills are necessary in virtually every profession. A survey of businesses in California resulted in the information that 80% of the computer usage is in the area of word processing, with graphics, data bases and spreadsheets following in popularity. (Hopkins, 1987)

Computer competencies are being written into Educational Codes and required for teaching credentials in the states of California, New York, and others, thus providing evidence that there is national concern among educators with providing equal access to computers for all children. (DuBois, 1986, p. 41) From the perspective of the American Indian child, computer instruction mean an increase in the desire and ability to learn language-based skills. These skills are increased because of the computer's power to move the child from the concrete world of images to the abstract world of conceptual thought. (Behrman, 1984, p. 72.) Computer instruction for these children can mean career education, as they learn skills that will be useful in higher education.

The computer can offer an interactive approach to learning. The child works with a program, he/she follows instructions, offers input, and receives feedback. In general, this sequences of guided choices holds regardless of the type of program, although there are differences in the degree of guidance. The most highly guided type of program is represented in the tutorial type of software, where a student is asked for a certain response, and the computer reacts to both right and wrong answers. A right answer results in praise: "Excellent," or "You win" or a similar expression flashes on the screen, whereas a wrong answer requires the student to try again.

In word-processing or graphics software, fewer guided choices are provided, and the student makes decisions about correctness. Here, the advantage of the computer is that the student can change something with

considerably more ease than with a typewriter. In a word-processing program, if the student wants to change the wording of a sentence, for example, the computer provides a way to cut out chunks of words in a text that exists only on the screen, thus eliminating the tedious process of retyping on paper. Some word-processing programs also offer extras, such as Spelling Checkers that note incorrectly spelled words and Text Editors for noting repetitions of terms, length of sentences, and types of sentence constructions. Students who are involved with these programs in public school are learning reading and writing skills that will transfer directly to higher education and careers.

In addition to guided choices and ease of modifying information, the computer offers a visual language and it offers a range of types of instruction that have been proven effective with Indian children, such as private, self-testing or cooperative learning. Emphasis on the visual facets of learning, private self-testing, and cooperative learning are more effective in general for Indian children than public testing in front of a teacher where each child is forced to compete with others. A study of the Warm Springs Indian children in Oregon, showed that these two types of instruction produced more interest in learning, resulting in increased participation in classroom activities. (Philips, 1972, p. 379)

In California, the Hupa, Yurok, Karuk, and Tolowa have found a cooperative learning methodology effective in teaching reading and writing, and have developed a computer curriculum for cooperative learning. Sponsored by Humboldt State University, these tribes have installed their own phonetic alphabet on the Macintosh computer, and produce their own bilingual instructional materials. Research conducted with the children have shown that those classroom teaching methods are successful with the Indian child that follow the traditional education practiced in the Indian home. Strategies that are founded on an Indian curriculum have been found to build self-esteem for the Indian child and are therefore crucial to language learning. (Gilliand, p. 90)

Cooperative learning that utilizes teamwork and peer teaching more closely parallels the Indian home teaching style. Computer instruction appeals to the Indian child because it brings her/him into contemporary American society. Cooperative learning on a computer has an appeal to the Indian because it combines the old and the new, being a sign of the Indian's evolution and successful adaptation to change.

Besides the benefits of computer instruction for the child, there are benefits for the public school teacher The teacher is interested in knowing how computer instruction can be integrated with her/his prior teaching, and particularly, with the role of computer curriculum with respect to required subject areas. The teacher will ask, "How can it assist me in teach reading, social studies, math, and other subjects?" "Can it teach a lesson on natural history?" The next section provides an account of how teachers have used computer instruction to create books

CREATING A BILINGUAL NATURAL HISTORY DICTIONARY

The computer provided a way for two American Indian classrooms to develop a communicative approach to learning about natural history. It enabled us to focus on language as it is used, to avoid drill, and to let the successful completion of an interactive goal be the reward. These are the basics of a communicative use of computers. (Underwood, 1984, p. 52)

We chose the Macintosh computer because it has the unique capacity for creating and installing fonts. A font is a set of characters that comprises all of the symbols that represent all of the sounds in any one language. This capacity enabled us to install a Unifon phonetic font as well as the English alphabet. The Unifon font was created for use with the Hupa, Yurok, Karuk, and Tolowa languages, and is used for teaching bilingual literacy in classrooms conducted in these languages.

The use of the Macintosh computer resulted in completion of children's natural history dictionaries by students in grades 3 through 8 in public schools in two Indian communities on the Hoopa Indian Reservation in Northwest California. The students were part of a bilingual field experience for teacher credential candidates conducted by the Bilingual Education Program at Humboldt State University.

The goal of the project was to develop dictionaries in Hupa/English and Yurok/English. Instructional objectives were to develop sentence-building skills, to increase knowledge about the natural world, and to incorporate cooperative learning methodology into computer instruction. There were several steps in the process.

The first step in the project was to create a font for the Unifon alphabet, and to install the fonts. Since each of the four Indian languages

has a different phonemic system, and a unique combination of letters in its alphabet, a font was created for each of the four languages. (Cogan, 1986) Installation of the fonts into a wordprocessing and a graphics program (MacWrite and MacPaint), were the next steps.

Then, groups of elementary school children, grades three through eight, were divided into teams of 2-3, and each team was told that their task for the day was to create one page in a dictionary. The dictionary was to contain names for plants or animals familiar to them. Each of the children chose one dictionary entry, and the child was told to "tell what they knew about that animal or plant." The child then composed sentences that were transcribed in Hupa or Yurok, using the Unifon fonts, and translated into English with the help of the bilingual resource teacher.

The project offered a learning experience based upon cooperation, as the children learned what choices were available in the design of the entries, and worked together designing the layouts of the pages.

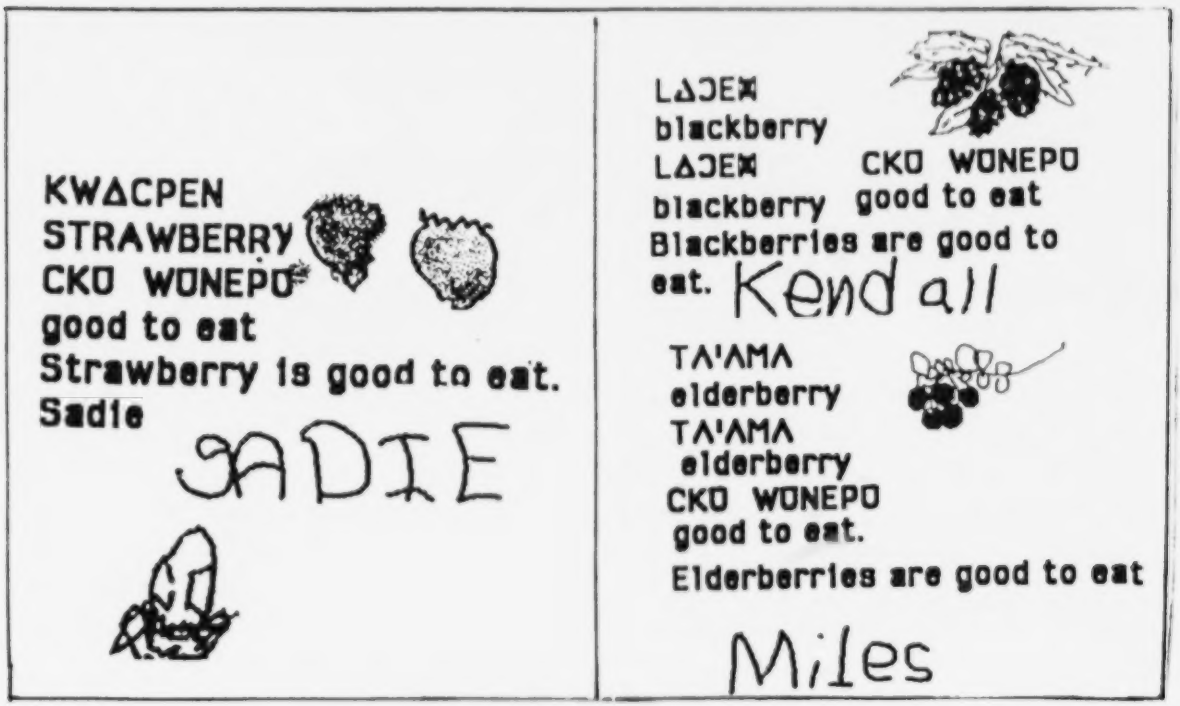
An interesting outcome of the project was that the children, without being so instructed, displayed the tendency to model their entries after those of previous participants. The younger children, grades 3-5, tended to imitate others virtually exactly in their definitions, varying only the word for the entry, whereas the older children, grades 6-8, served as models for the younger children, and they displayed a greater degree of variation in defining entries when in teams by themselves.

On the following two pages there are three sets of dictionary entries: 1) Those created by teams of students in grades 3-5; 2) those created by teams of students in grades 6-8; 3) those created by teams of students combining the two age groups.

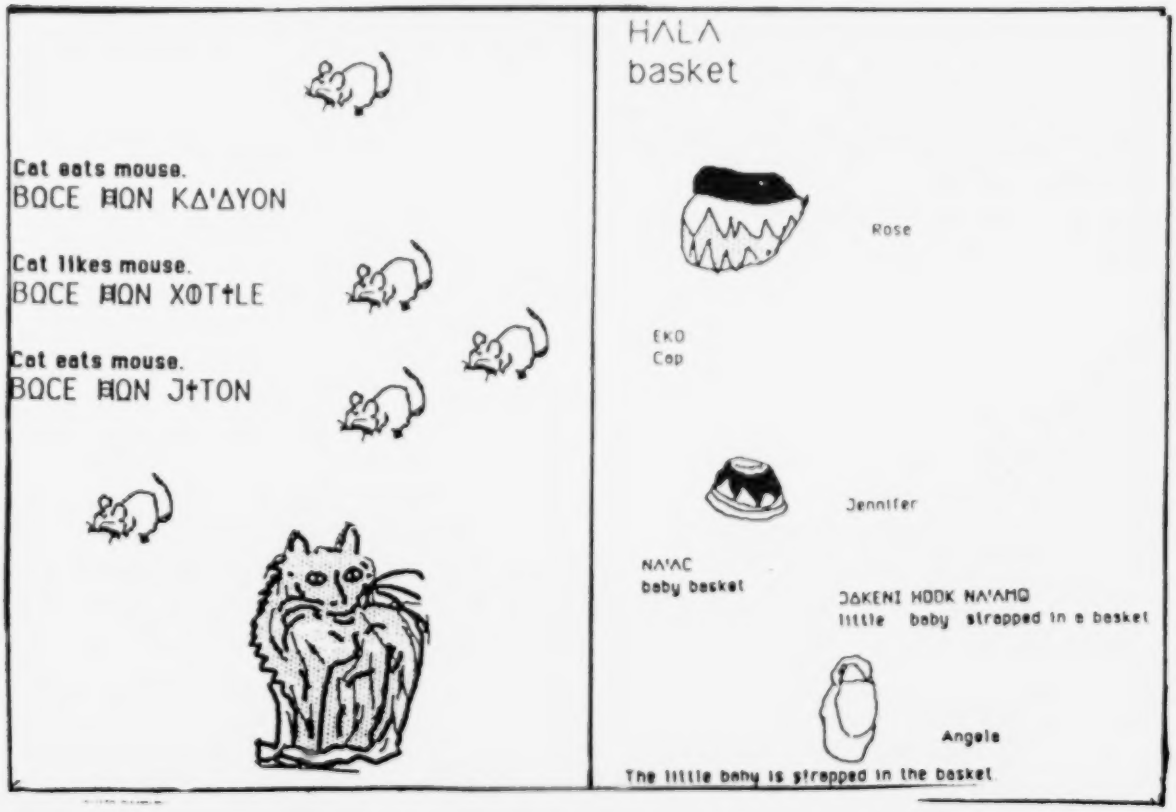
These dictionary entries demonstrate how strongly language learning occurs through imitating models for Indian students. These students managed to express individual creativity within a framework of imitation through an assortment of choices: In addition to the composition of the sentence, there were formatting choices: choice of fontsize, fontstyle, and font type. Choices to be made fell into the following three areas:

1) Writing: Sentence building

Dictionary Entries from Students in Grades 3-5



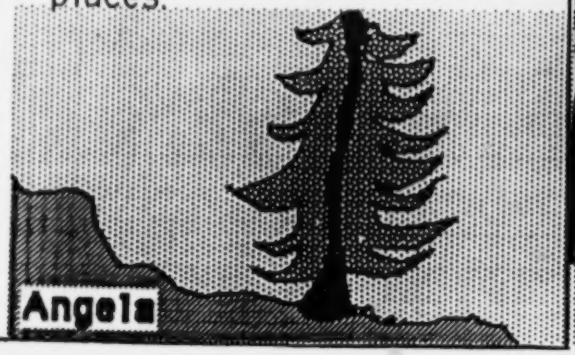
Dictionary Entries by Students in Grades 6-8



First entry by a 7th grader (Angela) model for 3rd graders' entries

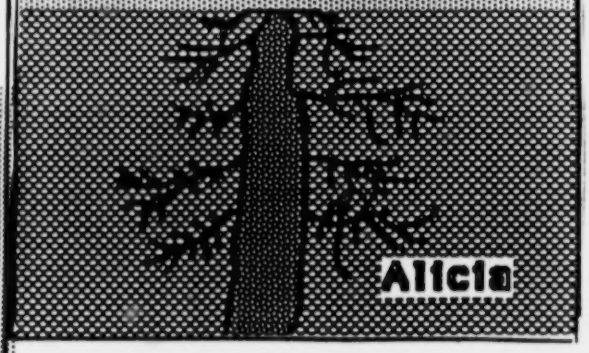
PA'AGEH NI HUNEM'
swampy place it grows
TAWAL NI TAPA
spruce

Spruce grows in swampy places.



Angela

KɬNI PA'AGEH
wherever swampy places
NI HUNEM' HA'UD
it grows cedar
Cedar grows in swampy places.

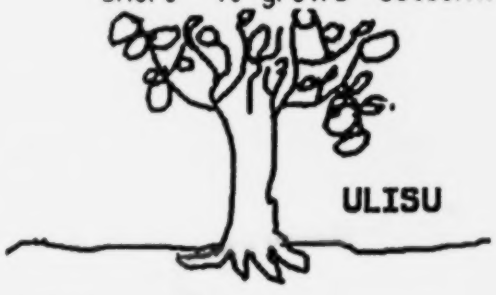


Alicia

KLOMEWE' KLOMEWE'
Cottontail grassy places

Cottontail stays in grassy places.

RIGAQ NI HUNEM' HAGOPA
shore it grows cottonwood

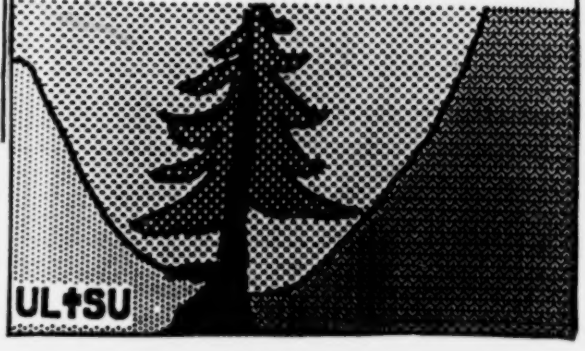


ULISU

HECI HIR
Little farther back from shore
NI HUNEM' HAGOPA
it grows cottonwood

LINU

JIKAL' NɬNI HUNEM'
everyplace it grows
U TAPA
fir RɬJƎRD



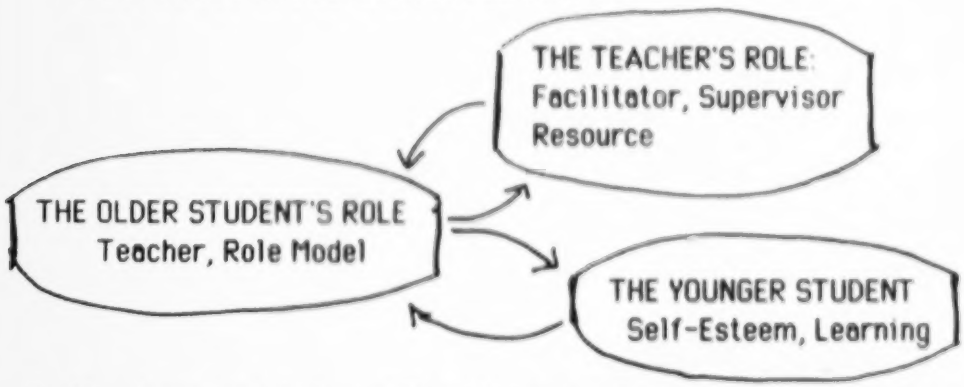
ULɬSU

2) Computer literacy: Doing word processing tasks, operating the graphics program, MacPaint

3) Cooperative learning: working together on a common task, an entire class sharing one computer

The perception of so many choices may have been a strong influence in the children's decision to imitate models. Modelling has been found to be a major learning role for Indian students. One study showed that teacher as role model is the most important teacher function. (Andreoli, 1987) Cooperative learning offers a variation on the teacher as role model, since the older peer becomes the role model, and the teacher is a resource. The following figure illustrates:

ROLE MODELS IN COOPERATIVE LEARNING

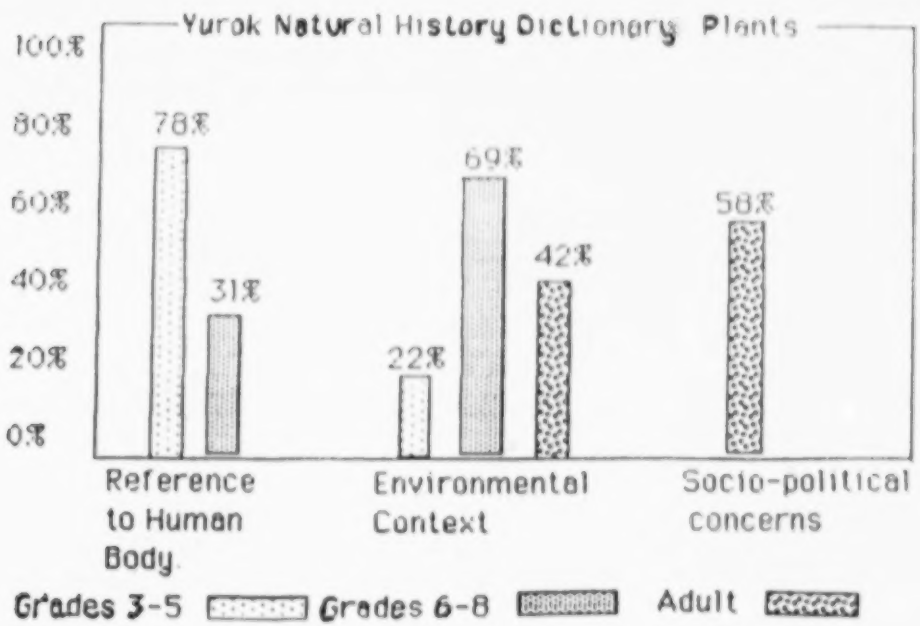


As the above model shows, the advantage of cooperative learning is that it involves teacher, older student, and younger student in a triad of partipation that utilizes the teacher's knowledge, but it emdphasizes the older students' expertise as teacher. It offers a bridge to the teacher for the younger student, and the chance for the older student to engage in the satisfactions of teaching while still a learner.

Older students involved in the dictionary activity were able to provide a model for younger children, who could feel more comfortable about their contributions, knowing that they were making guided choices. This is not to infer that in all cases the younger children followed the examples of their older peers. In fact, we were able to distinguish between the types of definitions created by students at three age levels. Younger children were prone to create definitions that referred to bodily functions, namely eating.

Students in the upper elementary grades were more likely to refer to the environment. Adults, in contrast, reflected a concern with environmental issues. The following chart indicates the percentages of persons from three age groups who created definitions in three categories:

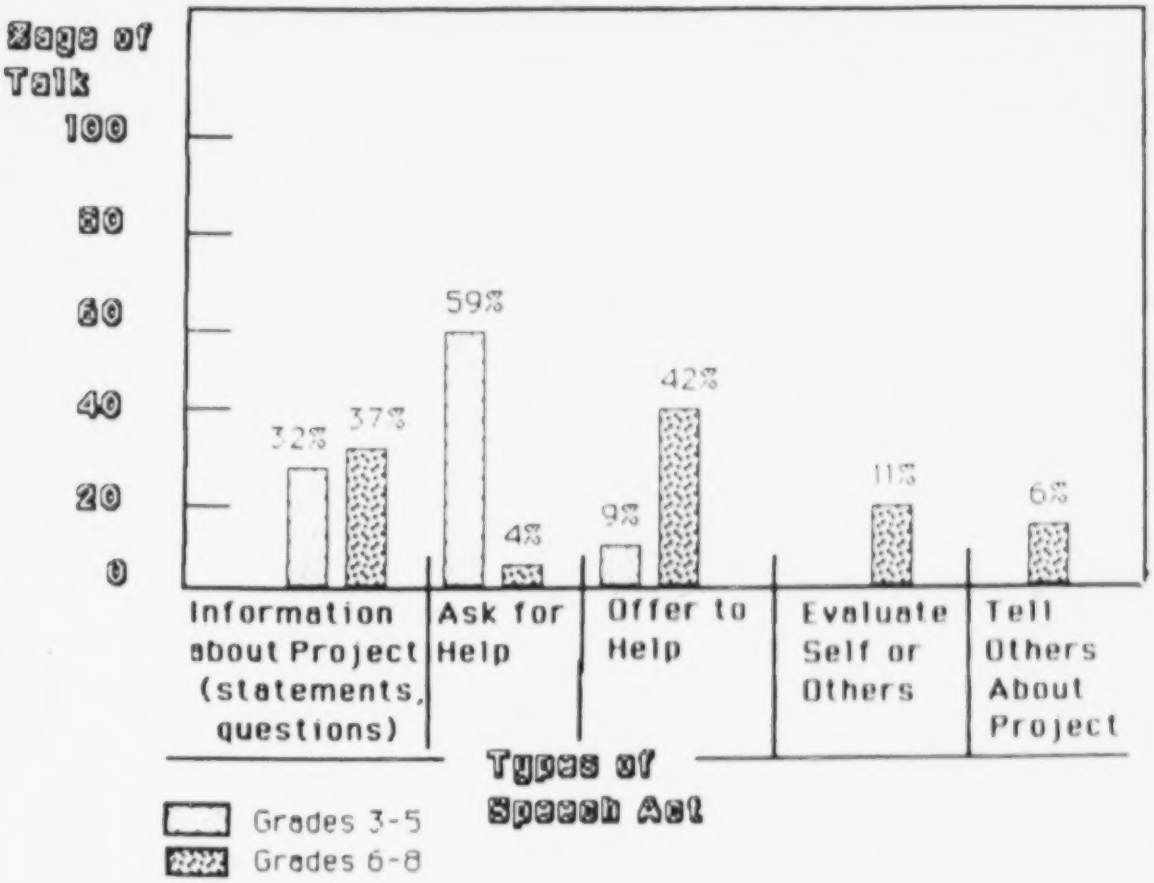
Table 1. The Development of Yurok Views About the Natural World



Whereas the above table shows some developmental differences in the content of the dictionary, results displayed in Table 2 display some developmental differences in types of talk that occurred during the dictionary task. It shows that the students took advantage of the cooperative nature of the project to communicate with each other and with the instructor. Further, when a code for communicative competence was used to analyze the task-centered talk, a developmental pattern was evident. Categories in the code are types of speech used in accomplishing the social interaction specific to this task:

1) Volunteering information necessary to complete the task or responding to elicitation
2) Asking for help
3) Offering help
4) Evaluating performance of self or others
5) Telling others about the Project

Table 2 **Types of Talk Demonstrating Development in Communication Skills**



As shown in Table 2, older students were more likely to offer than to ask for help (42% offering help, as compared with 4% asking for help). In addition, older students were more likely than younger students to be concerned with information about the task (37% of the older children, as compared with 32% of the younger children.) Further, there were two areas where older children expressed themselves, and there was no talk from the younger students: (11% of the older student's talk was evaluation, and 6% was to tell others about the project.) Finally, for both groups, 2/3 or more of the talk was person-centered as compared with information-centered talk.

INTEGRATING COMPUTER INSTRUCTION INTO THE BILINGUAL CLASSROOM

There are three basic categories of computer software: a Tutorial, a

Simulation, and a Tool. (Miller, p. 198) Whereas traditionally, most educational software falls into the first two categories, leading to the popularity of the Apple II series in schools, it is the Macintosh's power as a high-tech tool that has captured the attention in the workplace. The Macintosh is making Apple the fastest growing computer in the business market. This power to accomplish professional adult tasks makes it the ideal tool for teaching bicultural children. When Indian children in rural areas are taught how to use a Macintosh, they have knowledge that will assist them in pursuing a higher education, and in developing professional skills. Thus, the Macintosh is providing career education for these children at an early age, and can supply them with a growth in skills related to any career where computers are used.

Knowing that computer software falls into three categories, the task of the teacher is to find a way to use the tools within the framework of public school education. The bilingual teacher can view this task as (1) finding ways to teach standard subjects (writing, reading, math, science), as (2) pre-college training. What the teacher needs first are programs appropriate for a given subject area.

There are over 2,000 commercially available Macintosh programs, covering virtually any subject area. Before examining these, however, I offer this suggestion: Since most teachers who are searching for software are budget-minded, shareware is an important resource to be investigated. There are shareware brochures available through electronic bulletin boards, and in book form through commerical outlets, and Macintosh Users Groups. (One round of checking the local bulletin board came up with programs teaching vocabulary-building (Hangman8), world geography (Earthplot), concentration and visual memory (Concentration), and biology (Animals).

Finding programs that are relevant to American Indian culture is a more difficult task, but commercially available programs can be used as tools to explore such topics. For example, if a teacher of Northwest California Indian children wants a science lesson relevant to the local culture, the teacher might want to start with is the life cycle of the salmon. She/he can use a word processing program to tell the Myth of how the salmon were released.

Then she can use a data-base program to show how many salmon are released in a particular creek to swim up to spawn each day for a period of two months. Or she can use a spread sheet program to display the relationship between the survival of young salmon and weight at birth. In sum, the computer can help in the visual presentation of information, it can handle simulations of the voyage of many salmon to a creek to spawn, it can display through spreadsheets what the chances of survival of any one salmon egg are, it can display the importance of the salmon by a graphics display that labels the parts of the salmon in Indian and discusses their use, and finally, it can provide a way to integrate cross-cultural perspectives.

Using any software program that has a Font menu, and that has a capacity for installing an additional font, a student can write a bilingual text. Such software is available for word-processing (MacWrite, Microsoft Word,), for graphics (MacPaint, FullPaint), for data-bases (Microsoft File and Filevision are both data-bases with capacities for graphics displays built-in), for spread sheets (Jazz), and for desk-top publishing (Ready, Set, Go, and Pagemaker.)

Some tutorials also allow for the installation of fonts. These programs are particularly useful because they provided a greater degree of guidance to the student, and with the addition of bilingual fonts, can be used by the student to create bilingual texts. Some of these programs combine tutorials with word processing or graphics: both Kids Time and Kids Talk, for example, have bilingual capabilities, and have storywriting word-processing programs on them.

The matrix on the following page displays Software and Skill Areas that are appropriate to the kinds of skills offered through interaction with the computer. Reading, writing, and math practice are offered directly in available software, and there is available software aimed at specific disciplines, such as history, geography, or other areas in the social, biological and physical sciences. For the teacher, however, getting started using programs, it may be more useful to think of available programs in terms of developing thinking skills.[1]

WRITING A MACINTOSH PROGRAM

Teachers who find that there are limits to the number of programs with

Teaching with Macintosh Computer Software Programs

Software Program	Skills Area	Educational Level
WordProcessing		
Microsoft Word	Reading/Writing	3-12 (or when the child can read and operate the computer)
MacWrite	Reading/Writing	
Graphics		
MacPaint	WritingVisual Images	3-12 (or when the child can draw and operate the computer)
FullPaint	Writing/Visual Images	
DataBases		
Microsoft File	Problem-solving with visual images	7-12 (for the student who has an interest in experiments)
Business Filevision		
Spreadsheets		
Jazz	Problem-solving with manipulating variables	7-12 (developing math skills in social sciences and sciences)
Desktop Publishing		
Ready, Set, Go	Writing, editting, layout, graphics skills	7-12 (languages arts training aimed at publishing)
Pagemaker		
Programming Lang.		
MacBasic		
MacPascal	Linguistics, problem-solving skills, creative thinking skills	9-12 (or when the student shows an interest in programming)
MacForth		
Simulations & Games		
MacEdge II	Numerical recognition, arithmetic, phonics, reading, grammar, vocabulary	3-5 (until the child masters the basic skills of reading and arithmetic math)
Mind Over Mac		
Word Challenge II		
20 Questions (Animals) Dark Castle, Dungeons of Doom	Problem-solving, reading, creative thinking, , vocabulary, sentence-building	3-12 (according to ability level: for the child who is interested in designing game moves
Kids Talk		
Kids Time	Phonics, reading, sentence-building, syntax, grammar	3-6 (as long as the child shows an interest in sentence-building)
Smooth Talker		

bilingual capacities, and virtually no bicultural software for American Indians, may want to develop new software or modify existing software to meet the needs of the American Indian population. (Strickland, in Reyhner (Ed.), 1986, p. 188)

The next issue is how to create such a program.

Although the Macintosh is known for its "user friendliness," it is a complex computer to program. Some of the features that have designated it as a user-friendly system are its "human interface:" a high resolution screen and a mouse that combine to create an interactive environment. The mouse allows the user to quickly select an option, by guiding an arrow across the screen. A basic operation is to open up a file by clicking on the mouse with the arrow positioned on an "icon," a visual image that represents programs, files, and other things. As a result of the human interface, complicated syntax for commands need not be looked up or memorized for the Mac. The result is a high level of productivity that allows for creating and installing any sort of font, including phonetic fonts, that can produce high quality graphics, as well as high quality printed material. Learning to program such a computer is complex because it involves learning the network of commands already built into the computer and how to interface these chunks of information with other chunks, such as menu options, in creating new programs.

To program the Macintosh, one needs to know its internal organization with built-in software, based upon built-in ROM routines. (Morgan, 1985, p. 4) There are over 400 built-in ROM routines to learn, as well as the concepts behind these routines, and how to harness them. Routines, for example, are organized into managers. Managers consist of a cluster of routines that work together to operate a basic Macintosh concept; examples of managers are the menu manager that controls the operation of the menu commands. (Menu commands are the basis for the Macintosh concept of visual commands, made with the mouse and an arrow on the screen, rather than typed commands) or the window manager, that controls the opening and closing of windows that display the programs and files on a particular diskette.

Once the intracies of Macintosh programming are learned, the Mac programmer has a lot of power because Macintosh programs can cover virtually every subject area and every career area.

Conclusion

In discussing teaching and learning on the computer, I have given an account of the process that lead to the development of a computer curriculum in one bilingual teacher training program. By offering some information about the Humboldt State University bilingual computer curriculum, I hope to have provided a starting place for those bilingual/bicultural teachers who are interested in implementing computer curriculum into their classrooms. For those teachers who are already implementing bilingual computer curriculum, there is information on how to proceed in further development. Because this method is general, it can be tried by any teacher interested in developing writing and other language skills using a computer, with any group of children in need a new method of instruction. It is especially applicable to children from oral cultures such as the American Indian.

[1] Writing skills can cover a large large number of skills, when they focus on developing thinking patterns. I have identified two types of thinking skills, termed "Problem-solving skills," and "Creative Thinking Skills." Problem-solving skills aim at teaching the student to (1) pose the problem, (2) define the problem, (3) gather information pertinent to the problem, (4) develop a solution strategy, (5) find the solution, and (6) check the solution. (Bell, 1981)

Creative thinking involves another kind of thinking, divergent thinking. Divergent thinking aims at generating new thoughts, and is divided into four parts: (1) Fluency, the ability to perpetuate the flow of ideas; (2) Flexibility, changing one's ideas in response to perceived changes in a situation; (3) Originality, producing new ideas; and (4) Elaboration, adding to and modifying ideas. (Guilford, 1950) These types of thinking skills extend across subject areas, as they are the same processes that biologists use in determining genetic influences. These types of thinking skills may also be useful in arriving at thinking processes that unite Western science and American Indian thought, as they are reflected in the energy that inspires the passing on of the collective knowledge of the tribe in storytelling.

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